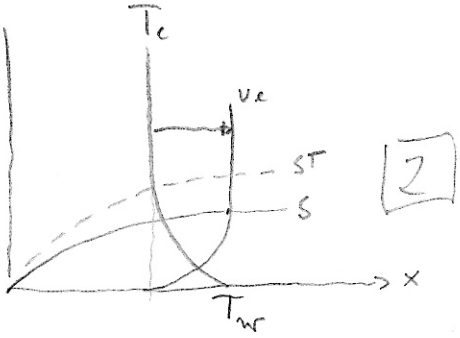
1



2

3 $\quad Pr = \frac{\mu c}{k} \qquad \left(\frac{\delta_T}{\delta}\right)^2 = \frac{1}{Pr}$

$E_c = \frac{u_e^2}{c(T_e - T_w)}$ — ENERGIE CINETIQUE / ENERGIE INTERNE

2

2 $\quad \delta(x) = \sqrt{\frac{2\nu x}{u_e}}$

2

$\rho \frac{u_e^2}{x} \simeq \frac{u_e}{\delta^2}\mu \Rightarrow \delta = \sqrt{\frac{\nu x}{u_e}}$

4 $\quad Pr \simeq 7$

EAU :-)

1

5 $\quad u\frac{\partial T}{\partial x} + v\frac{\partial T}{\partial y} = \frac{k}{\rho c}\frac{\partial^2 T}{\partial y^2}$

2

6 $\quad \eta(x,y) = \frac{y}{\delta(x)}$

$u = u_e f'(\eta)$

$v = u_e \delta'(x)(\eta f'(\eta) - f(\eta))$

$T = (T_e - T_w)\Theta(\eta) + T_w$

$(T_e - T_w)\left[u_e f'\Theta' \underbrace{\frac{\partial \eta}{\partial x}}_{-\frac{y\delta'}{\delta^2} = -\eta\frac{\delta'}{\delta}} + u_e \delta'(\eta f' - f)\Theta' \underbrace{\frac{\partial \eta}{\partial y}}_{1/\delta}\right] = \underbrace{\frac{k}{\rho c}}_{\frac{\nu}{Pr}}\Theta''\underbrace{\left(\frac{\partial \eta}{\partial y}\right)^2}_{1/\delta^2}(T_e - T_w)$

$\frac{k}{\nu\rho c}\nu = \frac{\nu}{Pr}$ $\qquad \frac{1}{Pr}$

5

$\underbrace{-u_e\delta'}_{u_e\sqrt{\frac{2\nu}{u_e}}\frac{1}{2}\frac{1}{\sqrt{x}}} f\Theta' = \underbrace{\frac{\nu}{Pr\,\delta}}_{\frac{\nu}{Pr}\sqrt{\frac{u_e}{2\nu x}} = \frac{1}{Pr}\sqrt{\frac{u_e\nu}{2x}}}\Theta''$

$\sqrt{\frac{u_e\nu}{2x}}$

2

7 $\quad q_w = -k\frac{(T_e - T_w)}{\delta}\Theta'$

8 $\quad [W/m^2]$

2

$Pr\, f\Theta' + \Theta'' = 0$

$\eta = 0 \quad \Theta = 0$

$\eta \to \infty \quad \Theta = 1$

FLUX CONVECTIF

$S_t = \frac{q_w}{c\rho u_e (T_e - T_w)}$

$N_u = \frac{q_w L}{k(T_e - T_w)}$

FLUX CONDUCTIF

9

2